

Testimony of Kenneth A. Colburn
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Subcommittee on Environment, Technology and Standards

Hearing on
Mercury Emissions: State of the Science and Technology
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Thank you Mr. Chairman. My name is Ken Colburn. I am the Executive Director of the Northeast States for Coordinated Air Use Management (NESCAUM).

NESCAUM is an association of state air pollution control agencies representing Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont. We provide technical assistance and policy guidance to our member states on regional air pollution issues of concern to the Northeast. On behalf of our eight member states, I would like to express our appreciation for this opportunity to address the Committee regarding the technological feasibility of controlling mercury from electric generating facilities. The timing is particularly opportune, as NESCAUM has just completed a thorough review and assessment of mercury emissions from power plants and control technologies to reduce these emissions.¹ This report, *Mercury Emissions from Coal-Fired Power Plants: The Case for Regulatory Action*, has been made available to the Subcommittee.

Concern over the adverse public health impacts associated with exposure to methylmercury has prompted all of the Northeast states to issue fish consumption advisories and to adopt and implement aggressive mercury reduction initiatives. In 1998, the New England Governors and Eastern Canadian Premiers (NEG/ ECP) adopted a regional Mercury Action Plan that established a science-based, integrated regional strategy intended to reduce in-region emissions by: 50% by 2003; 75% in 2010; and

virtually eliminate anthropogenic releases over the long-term. As of 2003, the region has achieved a 55% reduction in mercury emissions.

The success of the NEG/ECP effort is largely a function of the fact that the states and provinces conducted a careful analysis of the sources of mercury emissions in our region and technological feasibility of measures available to control these emissions. For example, based on our technology assessment, states were able to adopt standards for municipal waste combustors (MWCs) – the largest source of mercury in many Northeast States – nearly three times more stringent than the federal standards, and MWCs have routinely achieved compliance with even the most stringent state standards. Achieving our next goal of a 75% reduction will require equally aggressive controls on power plants which are now the largest source of mercury emissions in the region. To address this need, several states in the Northeast have already moved to include stringent mercury emission limits as part of multi-pollutant requirements for power plants. However, since about one-third of the mercury deposition in the Northeast is attributable to out-of-region sources, primarily power plants, a strong national mercury MACT standard is critical to our ability to protect the public from the harmful health effects associated with exposure to methylmercury.

In my testimony this afternoon, I will: (1) provide an overview of in-use mercury pollution control technology for power plants; (2) discuss emerging mercury-specific

¹ NESCAUM, *Mercury Emissions from Coal-Fired Power Plants: The Case for Regulatory Action*, October 2003. See www.nescaum.org.

control technologies; and (3) consider barriers to the development and deployment of mercury emission controls for power plants. Given the pending proposal of a Maximum Achievable Control Technology (MACT) standard by the U.S. Environmental Protection Agency (USEPA), I will relate my comments on technological feasibility to that process.

In-Use “Co-Benefit” Mercury Control Technologies

For existing sources, MACT cannot be less stringent than the average emission limitation achieved by the best performing 12% of the existing sources for which the Administrator has emissions information. This is known as the “MACT floor.” The USEPA has collected data from emission tests on 80 coal-fired boilers. If the boilers are ranked according to the percent reduction achieved, the average of the top 12% is a 91% reduction from the mercury in the combusted coal

At this point in time, in-use reductions from power plants accrue primarily as “co-benefits” associated with technologies designed to control pollutants other than mercury such as oxides of nitrogen (NO_x), sulfur dioxide (SO₂) and particulate matter (PM). All coal-fired power plants have at least some air pollution control devices, such as electrostatic precipitators or baghouses (also known as fabric filters) for particulate control; wet or dry scrubbers for SO₂ control; and low-NO_x burners, selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR) for NO_x control. Most of these controls can have impacts on mercury emissions and speciation. Electrostatic

precipitators, fabric filters and wet and dry scrubbers all have demonstrated particular promise in this regard.

A number of power plants already achieve impressive mercury reductions with technologies that are designed to control other pollutants. For example, four bituminous coal-fired plants with dry scrubbers and fabric filters each captured more than 95% of the mercury contained in the combusted coal during emission tests. Some plants burning subbituminous coal that are equipped with fabric filters and other stack controls achieved capture of 74 to 86% of the mercury in the combusted coal during emission tests. For example: an 86% mercury reduction was measured at a boiler equipped with a fabric filter and low NO_x burner; a 74% mercury reduction was measured at a boiler using limestone injection and a fabric filter; and an 84% mercury reduction was measured at Intermountain at a plant which burns subbituminous and bituminous coal in a boiler equipped with a low NO_x burner, a wet scrubber, and a fabric filter.

As these examples illustrate, mercury co-benefits from existing air pollution control technologies have already proven to be quite substantial. Moreover, at the time of these emissions tests, there was no attempt to optimize controls for mercury removal. Thus, the potential exists to increase mercury removal significantly using various optimization strategies on existing controls.

Emerging Mercury-Specific Control Technologies

Mercury-specific control technologies are well on their way to commercial availability.

For example, activated carbon injection technology is being successfully demonstrated in both pilot and full-scale applications. The results indicate that mercury control efficiency of over 90% is feasible for power plants, with costs that are comparable to the costs of NO_x removal required under the federal program to achieve national ambient air quality standards for ozone (i.e., in the range of 2 mills per kilowatt hour). According to an article in a recent American Coal Council publication, activated carbon injection “requires minimal new capital equipment, can be retrofit without long outages, and is effective on both bituminous and subbituminous coals,” and “it appears unlikely that compliance with pending mercury reduction regulations will result in significant fuel switching.”² Recognizing this opportunity, a permit issued in June 2003 for a new power plant in Iowa burning western subbituminous coal requires mercury reductions of over 80% using activated carbon injection.

Other promising technologies include enhanced wet scrubbing, K-Fuel[®], and Powerspan – ECO[™]. Enhanced wet scrubbing technology promotes the oxidation of elemental mercury in the flue gas prior to entering the scrubber, such that as high a fraction as possible of the total mercury is in the oxidized state and hence more easily removed in the scrubber vessel. Many approaches are under development to accomplish this goal, including those using chemical reagents, fixed catalysts, and high-energy oxidation.

KFX's K-Fuel[®] is a processed coal derived from western subbituminous coals. It is lower in ash, higher in BTU value, and produces lower pollutant emissions than the parent coals. K-Fuel[®] is processed in two-steps – physical separation and thermal processing – to produce a fuel that is higher value and “cleaner” than the original coal. The process involves elevated temperature and pressure, greatly reducing the moisture content of the coal. The mercury is volatilized and subsequently captured in a carbon-bed reactor.

Powerspan-ECO[™] is a post-combustion multi-pollutant control technology. It consists of a high-energy oxidation reactor followed by an ammonia-based scrubber and a wet electrostatic precipitator, which captures the products of oxidation. Fertilizer byproducts are generated (ammonia nitrate and sulfate), which should contribute to the overall economics of the technology.

While NESCAUM's new report focused on the above four mercury-specific control technologies as those closest to commercialization, the Subcommittee should be aware that several additional mercury control technologies have also emerged from the laboratory and are now being tested, including EPRI's “Toxecon” process, the use of flyash as a sorbent at GE Power Systems and CONSOL Energy, promising chemical (vs. physical) sorbents at Amended Silicates/ADA Technologies, and various metal

² Durham, Michael, *Tools for Planning and Implementing Mercury Control Technology*, American Coal Council, 2003.

amalgamation approaches. The fact that several of the above approaches were not even in existence 2-3 years ago illustrates the rapid pace of research in the area of mercury controls.

Barriers to the Development of Mercury Controls for Power Plants

Due to the pace of technology development, the only real remaining barrier to controlling mercury emissions from power plants is not a question of technology; it is a question of will: it is the current absence of the regulatory driver needed to create the opportunity – the demand – for mercury control technologies to come to market. At this point, coal-fired power plants are not installing aggressive mercury control technologies because they cannot do so; they aren't simply because there is no requirement for them to do so.

In September 2000, NESCAUM issued a report summarizing an in-depth study of the technology-forcing effects of environmental regulatory requirements.³ This study looked at the regulation of nitrogen oxide (NO_x) emissions from coal-fired boilers, sulfur dioxide from coal-fired boilers, and automobile emissions. It concluded that regulations with well-defined targets and compliance deadlines drive innovation in control technology, resulting in dramatically lower implementation costs than initially projected. Similar analyses of approximately a dozen major regulatory initiatives ranging from

³ NESCAUM, *Environmental Regulation and Technology Innovation: Controlling Mercury Emissions from Coal-Fired Boilers*, September 2000. See www.nescaum.org.

CFCs to landfill leachate show that initial cost estimates were at least double the actual costs and often far higher.⁴

Simply put, the principal barrier to the development of cost-effective controls for mercury emissions from power plants has been EPA's failure to date to establish an appropriate MACT standard for this sector, and we have no doubt that the documented history of regulatory-driven technology innovation and cost reduction will repeat itself if and when EPA does establish an appropriately stringent mercury MACT standard.

Coal-fired boiler operators suggest that EPA proceed only gingerly – if at all – with mercury reduction requirements because, they claim, there are no “commercially available” mercury control technologies. This suggestion dovetails closely with the above discussion of barriers. When does an “available” technology become “commercially available”? When it provides competitive advantage to the buyer, or when the buyer is required to modify its practices to meet a larger societal need, e.g., through regulation. “Commercial availability,” then, resembles a “chicken or egg” scenario. Which comes first, “commercial availability” or regulatory obligation? Per the above discussion concerning barriers, history shows that well-designed regulatory requirements with appropriate lead times result in the commercialization of technological innovation, not vice versa.

⁴ Worldwatch Institute, *Working for the Environment*, Paper #152. See www.worldwatch.org.

Let's also consider precisely what industry opponents mean by "commercial availability." Southern Company recently indicated that "There are currently no commercial technologies that are available for controlling mercury from coal-fired power plants. There are no vendors that are offering process systems that are supported by guarantees from the vendor for mercury control performance under all the conditions that an ordinary power plant is expected to encounter over the course of normal operating conditions and timelines" [emphasis added].⁵ These caveats suggest that industry seeks zero risk regarding mercury control performance, which leads me to wonder if it would accept a corresponding zero percent return on any mercury control investments made under such caveats.

In sum, we need to expose the "commercial availability" argument for the red herring that it is. Other red herrings lie in the wings, including (a) the technologies don't deliver good results all the time, (b) the cost is too high, and (c) the technologies can't be installed in time. History shows that market forces will capably address each of these concerns. Technology rapidly gets the kinks out and becomes reliable, costs drop dramatically, and the market gets the job done on time. But that won't happen until there is a market, and there won't be a market until there is a driver – a stringent mercury MACT.

⁵ Monroe, L., Southern Company, from *Mercury Rising*, UtiliPoint IssueAlert, July 15, 2003. See www.utilipoint.com/issuealert/print.asp?id=1749.

In conclusion, I am reminded of an aphorism that arose during earlier NO_x negotiations with the power sector, but seems no less applicable to mercury emissions: “Ask an engineer to do something, and you get nothing but problems. Tell an engineer to do something, and you get nothing but solutions.” Today, we are getting significant mercury reductions as co-benefits from non-optimized controls for other pollutants. We have full scale tests on new, cost-effective control technologies that reduce mercury substantially from a variety of coals. And we have new, even more promising mercury control technologies coming out of the labs. Let’s tell our power sector engineers that it’s time to reduce mercury emissions by 90% and begin to reap the public health and environmental technology benefits that the resulting market will bring forth.